PATENT APPLICATION
ATTORNEY DOCKET NO. 15115.240001

ARTICLE 34 AMENDMENTS
(English Translation)

FOR

PCT/JP2005/002045

TITLE: **SURFACE PLASMON RESONANCE SENSOR**

CLAIMS:

1. (After amendment) A surface plasmon resonance sensor chip comprising:

a transparent substrate with a flat surface; and

a metal layer including a flat part of metal thin film formed on the substrate, and a plurality of metal particles that are arranged spaced apart from each other immediately above the flat part and that have a diameter of greater than or equal to 20nm and less than or equal to 150nm made of the same material as the flat part.

2. DELETE

3. DELETE

4. DELETE

5. The surface plasmon resonance sensor chip according to claim 1, wherein the material of the metal layer is gold or silver.

6. A method of manufacturing a surface plasmon resonance sensor chip, the method comprising the steps of:

forming a metal thin film on one surface of a substrate through sputtering or deposition;

chemically modifying the surface of the metal thin film; and

immersing the chemically modified substrate into a liquid solution of metal particles.

7. A method of manufacturing a surface plasmon resonance sensor chip, the method comprising the steps of:

immersing one surface of a substrate in a liquid solution of aminosilane coupling agent;

immersing the substrate into a liquid solution of metal particles;

cleaning the substrate; and

forming a metal thin film on the one surface through sputtering or deposition.

8. (After amendment) A surface plasmon resonance sensor comprising:

a surface plasmon resonance sensor chip according to claim 1 or 5;

a prism arranged on the side of the chip not formed with the metal layer;

a light source for irradiating light on the chip through the prism; and

a light detector for measuring the reflectivity of the light by the metal layer.

9. (After amendment) A method of measurement using the surface plasmon resonance sensor chip according to claim 1 or 5; the method comprising the steps of:

contacting sample solution to the metal layer side of the sensor chip;

irradiating the light having different frequency or angle of incidence from the side of the chip not formed with the metal layer from an optical system towards the chip;

detecting the light totally reflected at the interface of the metal layer and the substrate with a light detector;

obtaining at least two resonance frequencies or resonance angles from the intensity of the totally reflected light detected with the light detector; and

simultaneously measuring the change in the index of refraction of the sample solution in the vicinity of the metal particles and at a distance of about the radius of the metal particle from the surface of the metal particles based on the change in one of the resonance frequency or the resonance angle of the change in the two resonance frequencies or the resonance angles, and the

change in the index of refraction of the sample solution distant than the detecting range of the change in the index of refraction of the sample solution in the vicinity of the metal particles and at a distance of about a several hundred nm from the surface of the flat part based on the change in the other resonance frequency or the resonance angle.

10. (After amendment) The method of measurement according to claim 9, wherein

the sample solution contains biomolecules;

the method further comprise the step of immobilizing acceptors on the metal layer of the sensor chip; and

the presence and the extent of interaction between the biomolecules and the acceptors are obtained based on the change in the index of refraction of the sample solution in the vicinity of the metal particles and at a distance of about the radius of the metal particle from the surface of the metal particles.

Fig. 1

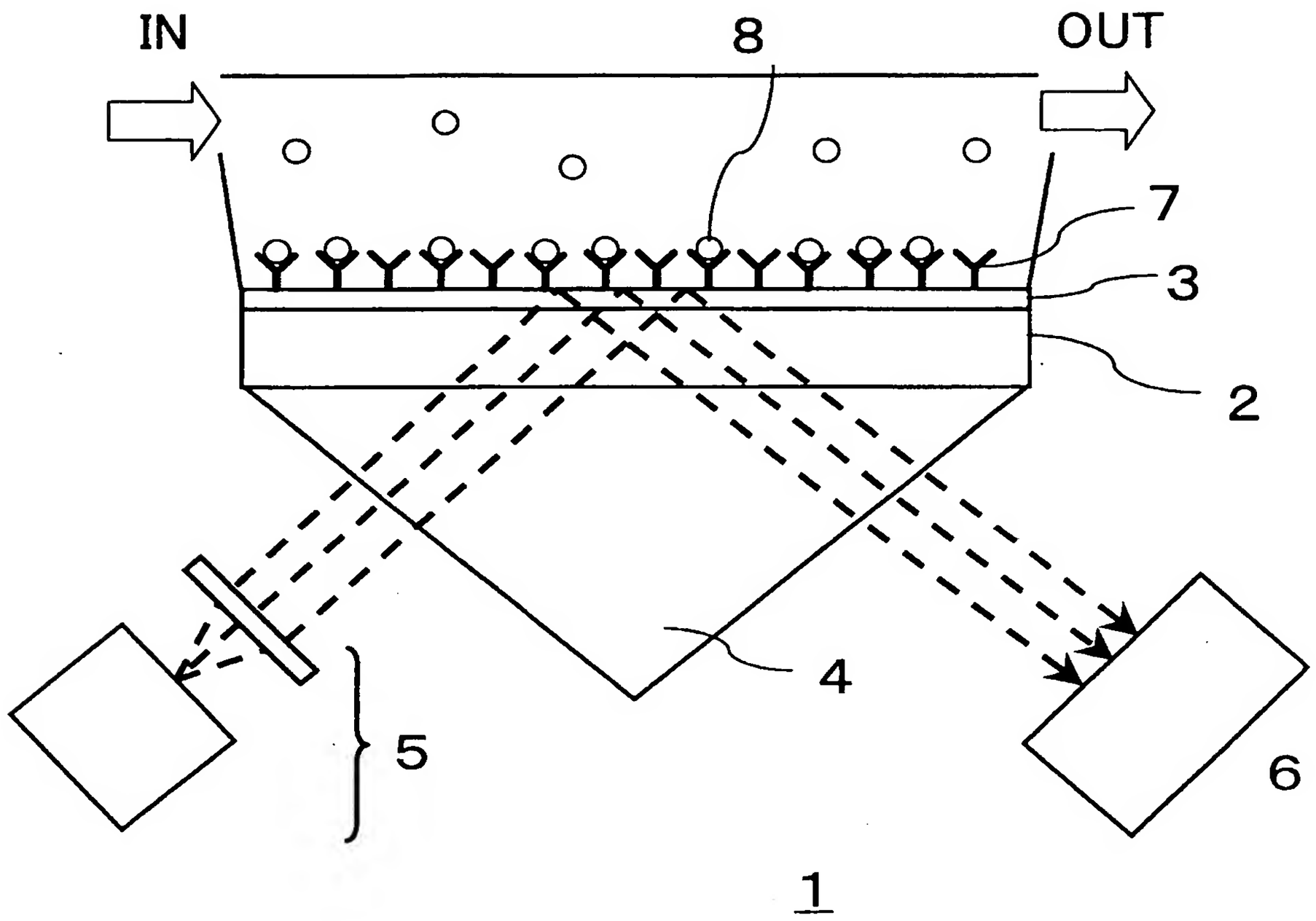

Fig. 2

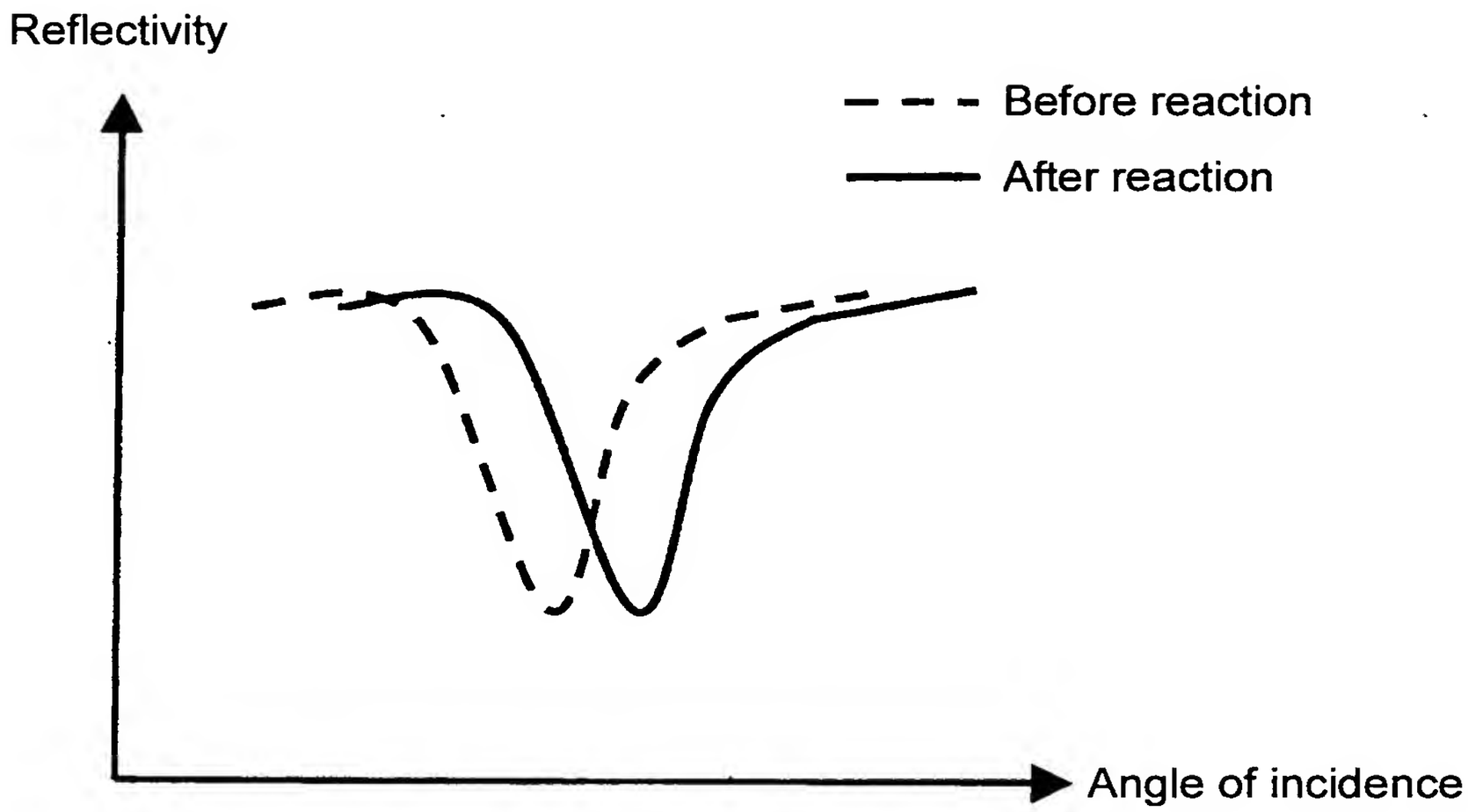
Reflectivity
Before reaction
After reaction
Angle of incidence

Fig. 3

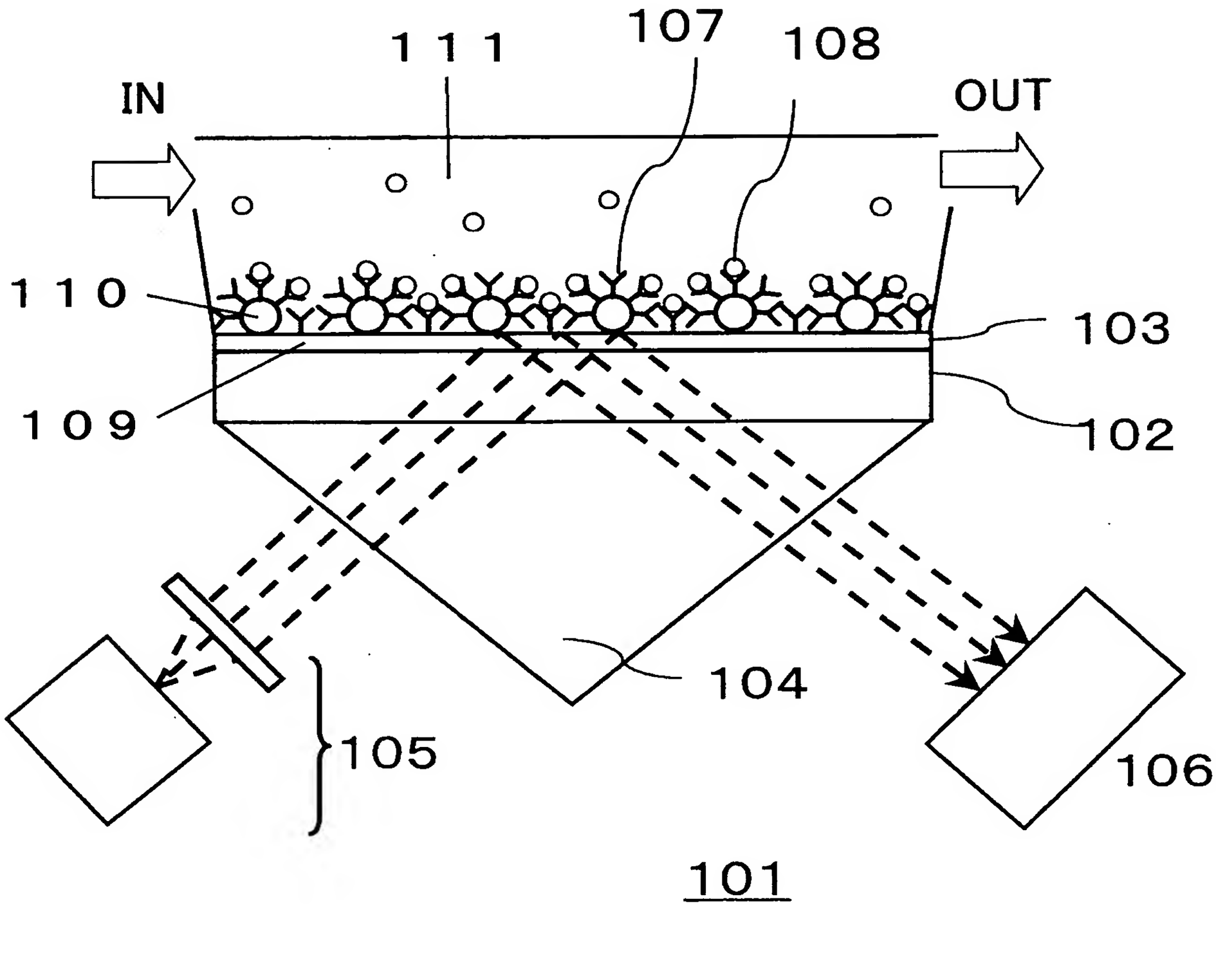

Fig. 4

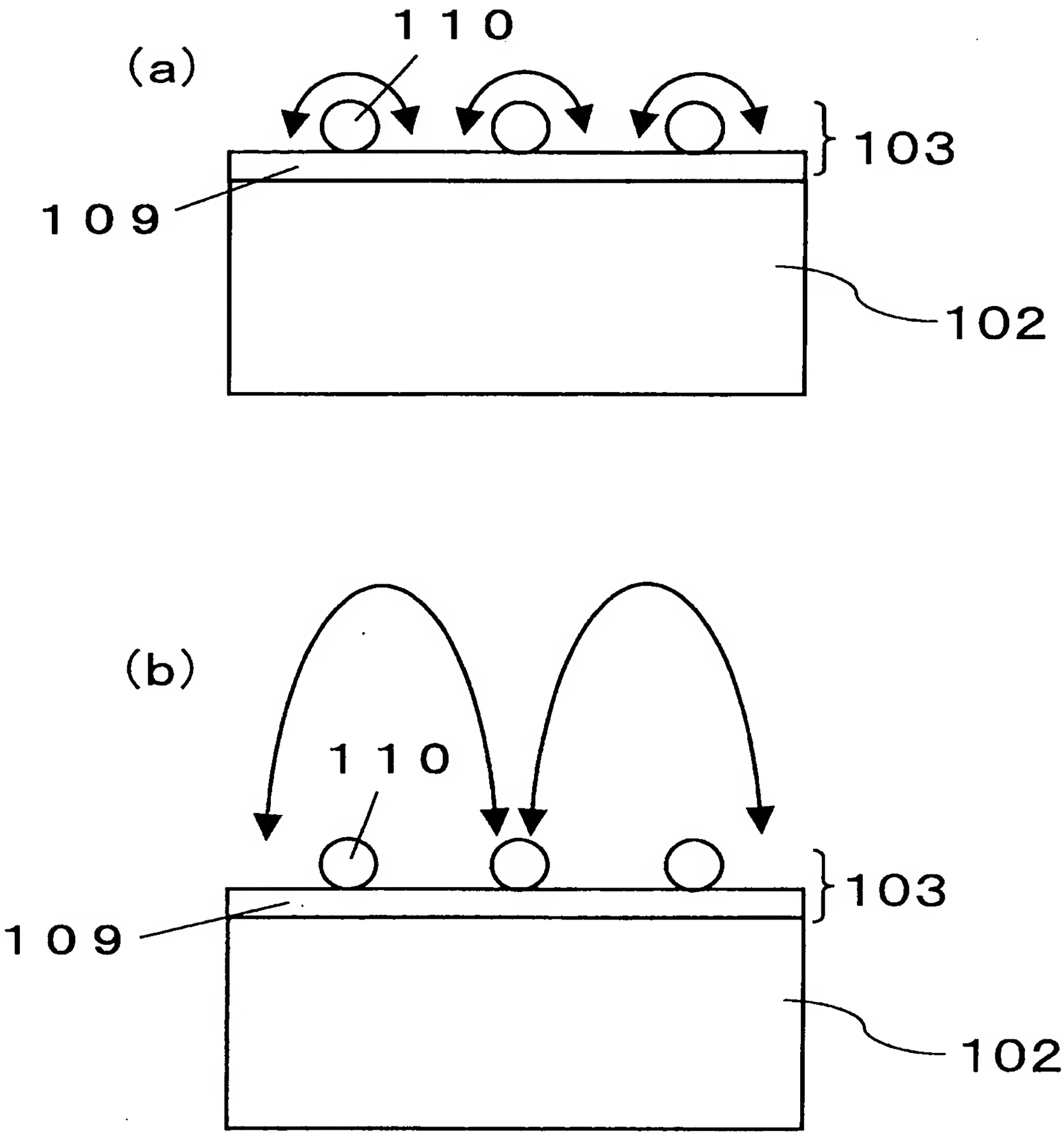

Fig. 5

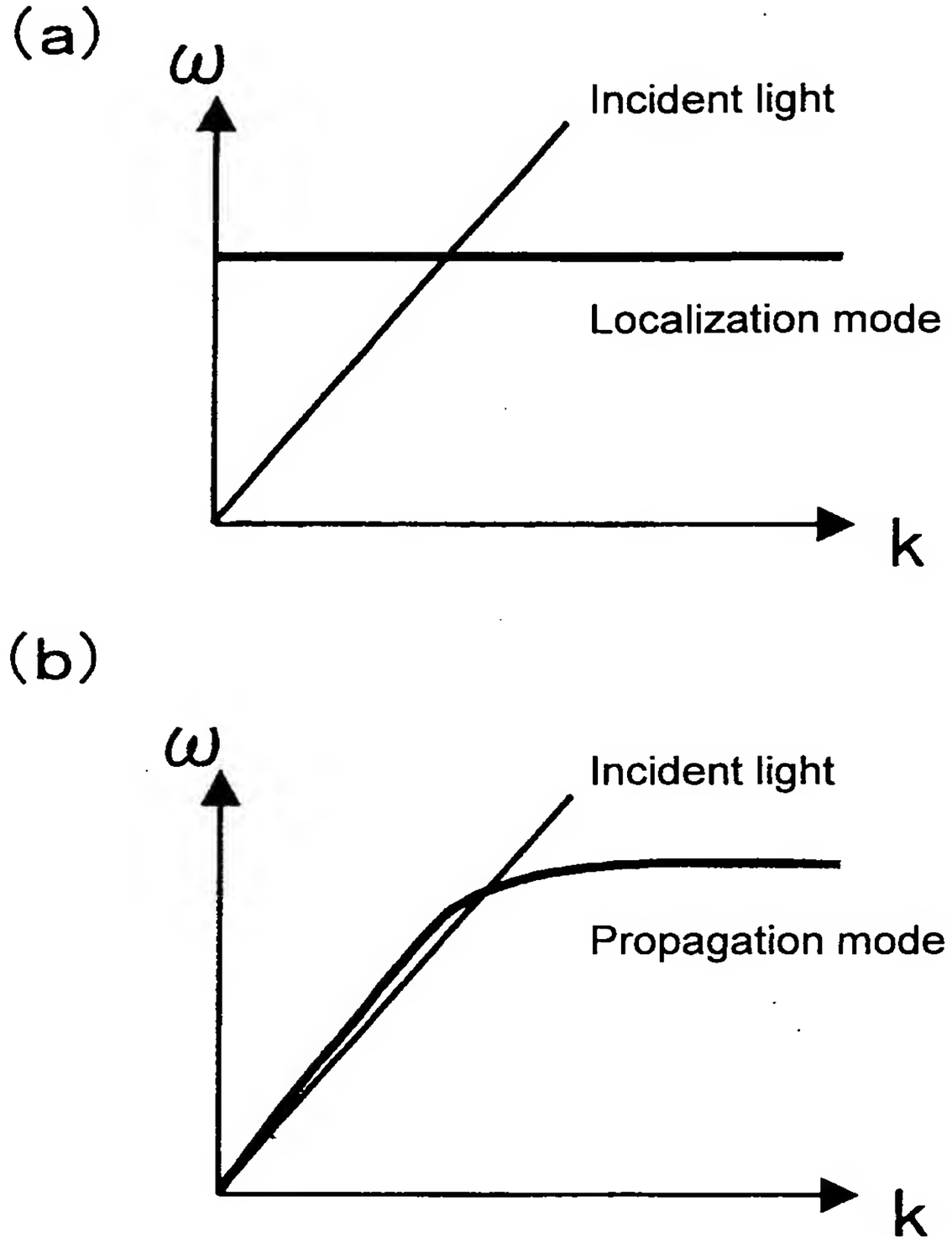
(a)
ω
Incident light
Localization mode
k
(b)
ω
Incident light
Propagation mode
k
(c)
ω
b
c
Hybrid mode
Q
d
P
a
k

Fig. 6

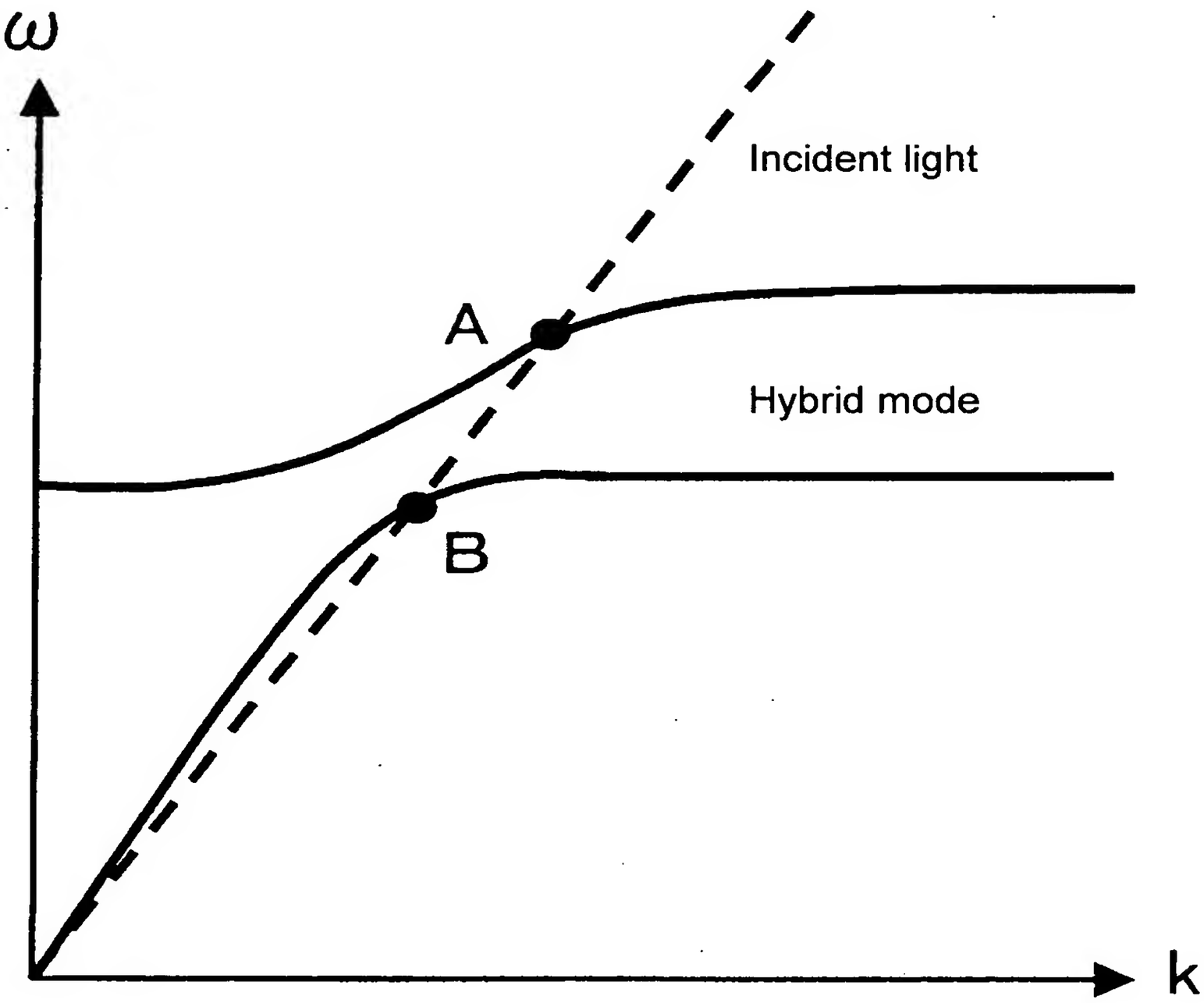

Fig. 7

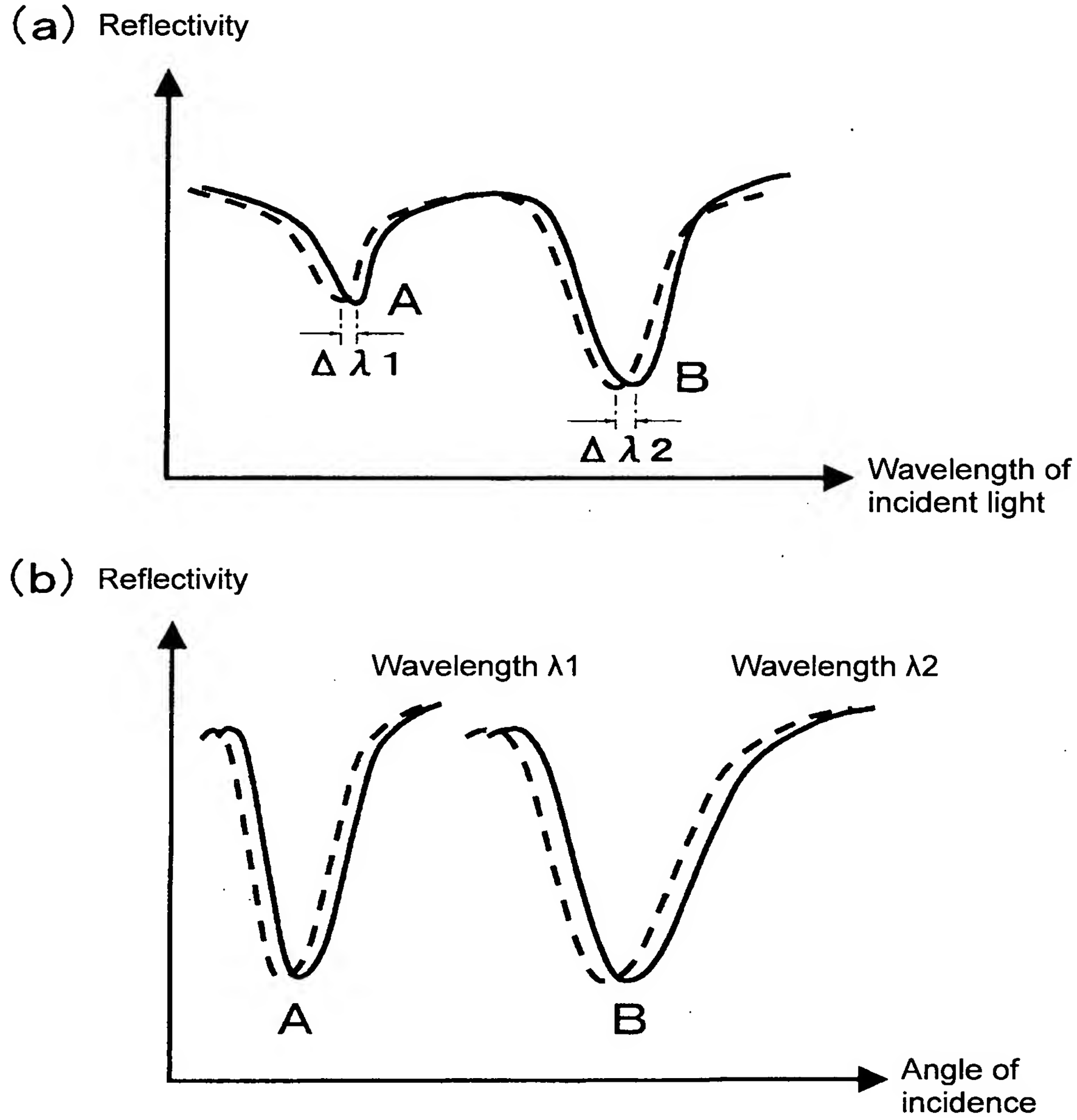
(a) Reflectivity
A
Δλ1
B
Δλ2
Wavelength of incident light
(b) Reflectivity
Wavelength λ1
Wavelength λ2
A
B
Angle of incidence

Fig. 8

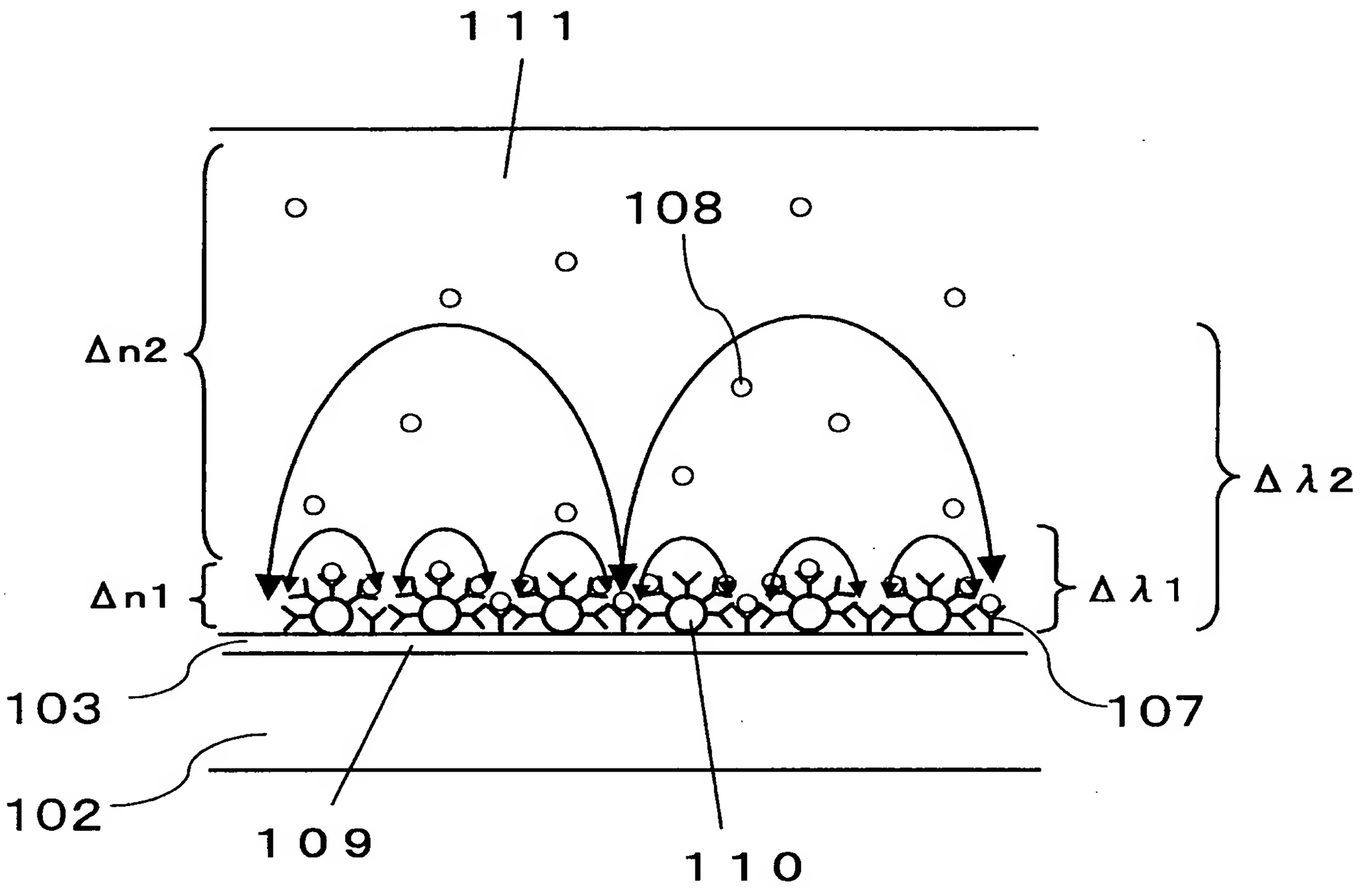

Fig. 9

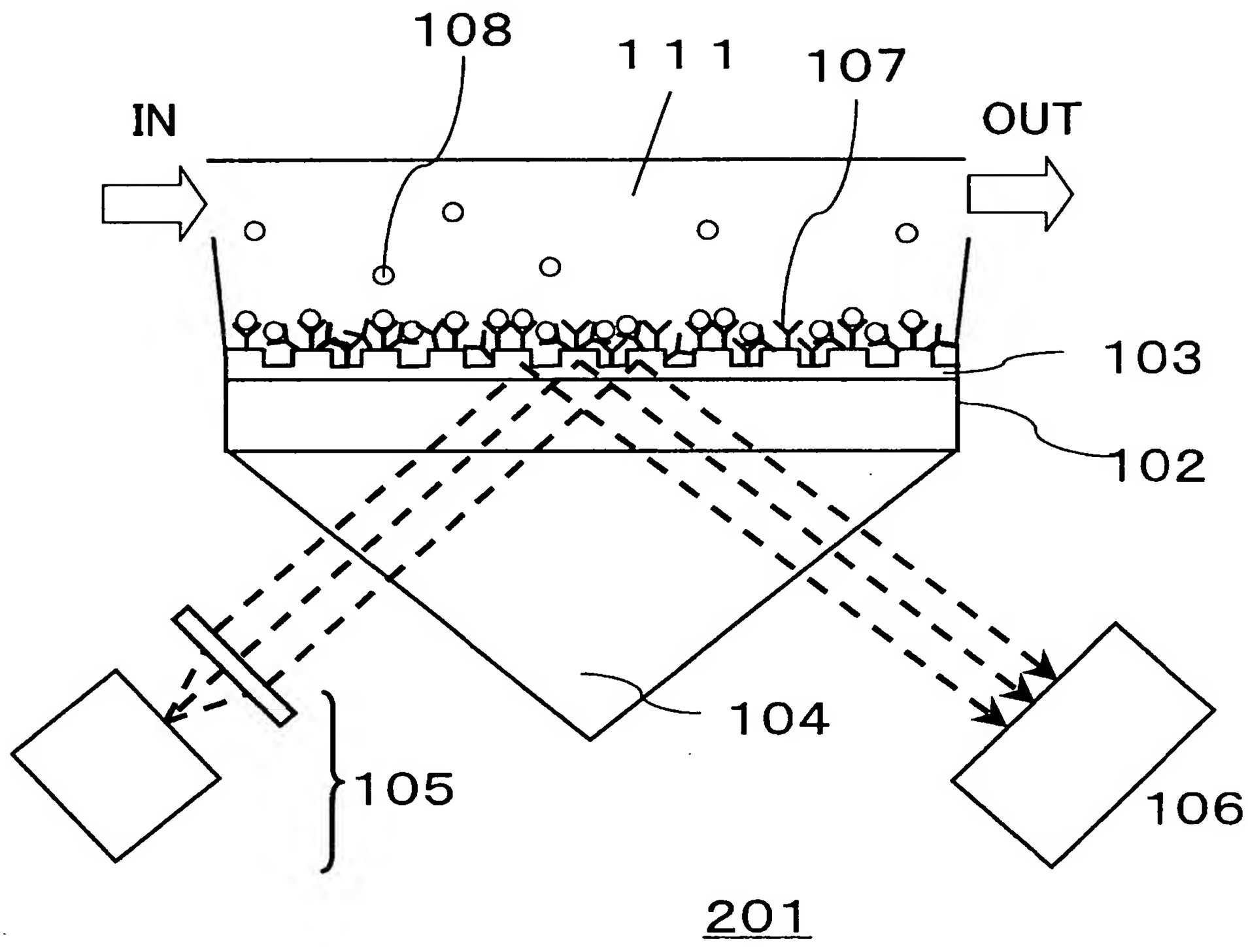

Fig. 10